

## **CHAPTER 8**

### **TROUBLESHOOTING**

### **LESSON PLAN 8**

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#### **METHOD:**

Conference, demonstration, and practical exercise

#### **TIME ALLOTTED:**

1.5 hours

#### **COURSE PRESENTED TO:**

- a. LAV-25 crews
- b. Instructors
- c. TAVSC personnel

#### **TOOLS, EQUIPMENT, AND MATERIALS (Per Vehicle Crew):**

- a. LAV-25 with SL3 and PGS installed
- b. TM 08594A-12&P

#### **PERSONNEL:**

- a. Primary instructor
- b. Assistant instructor

#### **INSTRUCTIONAL AIDS:**

- a. Overhead projector
- b. Viewgraphs (Appendix D)

#### **REFERENCES:**

- a. TM 08594A-12&P, Chapters 3 and 4
- b. TM 08594A-10/1A

#### **APPENDICES:**

- Appendix A. Safety
- Appendix B. Viewgraphs

## 8-1. INTRODUCTION.

(5 minutes)

Note. Show Slide 1.

- a. **Reason.** PGS was designed to be a reliable and durable system, but as with any equipment, it can fail. When PGS failures occur, the crew must be able to identify, troubleshoot, and correct the problem.

Note. Show Slide 2.

- b. **Training Objective.** Given an operational LAV-25 with PGS installed and aligned, you will demonstrate the following:
  - (1) Discuss troubleshooting procedures.
  - (2) Perform BIT initialization and discuss failure information.
  - (3) Conduct troubleshooting.
- c. **Procedure.** During this block of instruction we will cover PGS troubleshooting procedures. After this lesson, you will be able to troubleshoot and correct failures that may have occurred.

## 8-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE. (60 minutes)

- Notes.
- 1. The primary instructor will release the student crews to their assigned assistant (small group) instructor for the practical exercise portion of this lesson.
  - 2. Show Slide 3.

- a. **General Troubleshooting Procedures.**
  - (1) Verify that vehicle is set up properly to perform the intended function. A round is loaded, the gun armed, etc.
  - (2) Perform troubleshooting IAW Chapters 3 and 4 of TM 08594A-12&P.
  - (3) Verify all cable connections within PGS and between PGS and vehicle.
  - (4) Check PGS components for visible damage.
  - (5) Have PGS trained troubleshooter or Training Audio Visual Support Center (TAVSC) replace components if needed.

Note. Show Slide 4.

**Warning.** Perform all corrective action with vehicle MASTER SWITCH and turret power OFF. Damage could occur to PGS or vehicle or personnel could be injured if cables are connected or disconnected with MASTER SWITCH and turret power on.

## 8-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).

Note. Show Slide 5.

- b. **Built-In Test (BIT) Initialization.** BIT can be initiated in several ways. Error messages are presented on the control panel as a pop-up screen.
- (1) **Automatic BIT.** BIT is automatically performed when power is switched on. Any failure during operation will be announced over the vehicle intercom together with an error pop-up on the control panel display screen.
  - (2) **During simulation.** Each PGS component performs a BIT before and after a simulation. This is to ensure that the system can perform or has performed a correct simulation.
  - (3) **Manual initialization.** The operator can manually perform BIT by using the TEST menu of the control panel.

Note. Show Slide 6.

- c. **Error Information.** There are two main types of error messages:
- (1) **NO CONNECTION X UNIT.** This message is displayed when a unit does not respond during BIT. The probable cause may be a loose or damaged cable or an internal failure of the unit.
  - (2) **ERROR X UNIT.** This message is displayed when a unit has a sub-function failure. The error can normally be corrected by replacing the unit indicated.

Note. Show Slide 7.

- d. **System bus.** Major components in PGS are linked together on a high speed bidirectional data bus called Controller Area Network (CAN). The high speed data bus is used for communication between components within the system and to distribute power to all PGS components. The data bus connects to the transceiver unit, TBOS driver unit, target computer unit, vehicle interface unit, remote system interface, video mixer, and control panel. If a NO CONNECTION error occurs, knowing the unit location within the CAN may help troubleshoot more efficiently. The minimum system components needed to perform a BIT are the control panel, vehicle interface unit and vehicle power.

Note. Show Slide 8.

- e. **Error Presentation.**
- (1) **Intercom announcement.** A voice over the intercom informs the operator when an error occurs. The intercom announcement only informs the crew to check the control panel. The control panel indicates which type of failure has occurred.
  - (2) **Pop-up screen on control panel.** When an error occurs within the system, this is indicated with a pop-up screen superimposed over the control panel menu.

## 8-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).

- (3) **Error list.** Errors in the system are also listed in the TEST menu ERROR LIST. Multiple errors can be presented if the list is scrolled using arrow pushbuttons of control panel.
- (4) **Errors logged on TDRS memory card.** Errors detected in the system are logged on the TDRS memory card. Errors logged on the card include a failure number indicating the failed sub-component. This number assists Contractor Logistic Support (CLS) personnel in troubleshooting faulty components.

Note. Show Slide 9.

- e. **Errors Not Covered by BIT.** Some failures are not detected by BIT. These errors must be identified through replacement comparison tests.

- (1) **Transceiver unit output.** If the system does not give a result during normal operating conditions, replace the transceiver unit and perform a comparison test.
- (2) **System accuracy.** The accuracy of the transceiver unit is not covered by BIT. If ammunition dispersion appears larger than normal, replace transceiver unit and compare results.

Note. Show Slide 10.

- (3) **Vehicle interface.** Vehicle signals to the simulator are not monitored. PGS cannot distinguish between vehicle failure and PGS failure. If a function related to the vehicle is inoperable, troubleshoot the vehicle without PGS.

Note. Show Slide 11.

- f. **LED Indications.** Some of the PGS components have light emitting diodes (LEDs) that can be of assistance during troubleshooting. The LEDs are located within the moisture indicators and indicate with a blinking indication that power is applied correctly. The following units indicate with a red LED.

Note. TBOS driver unit indicates ONLY during simulation of a round or when the control panel is activated (i.e., during BIT).

- (1) **Vehicle interface unit.** The vehicle interface indicates that 24 volts are correctly distributed to the rest of PGS. The blinking indication is there if power is applied correctly. If LED is constantly on or not on at all, a problem is likely to be found in PGS.
- (2) **Target computer unit.** The target computer unit indicates that 24 volts is being correctly processed within the unit. The blinking indication is there if power is correctly processed. If LED is constantly on or not on at all, a problem is likely to be found in PGS.

## 8-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).

- (3) **TBOS driver unit.** The TBOS driver unit indicates that 24 volts are correctly processed within the unit. The blinking indication is there if power is correctly processed. If LED is constantly on or not on at all, a problem is likely to be found in PGS. The unit will not indicate unless a round is simulated or the control panel is active.
- (4) **Remote System Interface (RSI) Unit.** The RSI unit indicates that 24 volts are correctly processed within the unit. The blinking indication is there if power is correctly processed. If LED is constantly on or not on at all, a problem is likely to be found in PGS.

- Notes.
- 1. The primary instructor now releases the student crews to their assigned assistant (small group) instructors for the practical exercise portion of this lesson.
  - 2. Direct students to their appropriate training station.
  - 3. Each assistant instructor is to conduct a safety briefing for his small group IAW Appendix A.
  - 4. The assistant instructor discusses and clarifies the procedures as required and reinforces the training objective.

**Warning. Ensure TURRET DRIVE LOCK is set to LOCKED before removing PGS.**

**Warning. Ensure vehicle MASTER SWITCH and turret power is OFF before removing PGS.**

## 8-3. TROUBLESHOOTING.

Simulated errors will be inserted into PGS by the instructor. The student will isolate and correct the error using the BIT and must follow troubleshooting procedures IAW TM 08594A-12&P, Chapters 3 and 4. The instructor will verify that the proper corrective action was applied.

## 8-4. FINAL REVIEW. (5 minutes)

### a. **Student Questions.**

Note. Show Slide 12.

### b. **Summary of Main Teaching Points.**

- (1) Troubleshooting procedures
- (2) BIT initialization and failure information
- (3) Practical troubleshooting

Note. Show Slide 13.

- c. **Closing Statement.** This block of instruction has prepared you to understand troubleshooting procedures used with PGS. The knowledge gained in this lesson will help when troubleshooting a PGS with a malfunction.

## **APPENDIX A TO LESSON PLAN 8**

### **TROUBLESHOOTING**

#### **SAFETY**

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The general safety regulations below must be followed during the performance of this lesson. ALL safety regulations outlined in TM 08594A-10/1A must be strictly followed.

1. Mount and dismount vehicle over left-front or through the back hatch.
2. Maintain three (3) points of contact while on top of vehicle.
3. Follow unit SOP on smoking near vehicle.
4. Do not go over or under gun barrel.
5. Ensure that TURRET DRIVE LOCK is set to LOCKED.
6. Set vehicle MASTER SWITCH OFF.
7. Turn turret power OFF IAW TM 08594A-10/1A, paragraph 2-56.
8. Ensure that AP and HE feed shaft stop knobs (located on left side of main gun feeder) are pushed IN before training. When knobs are out, electrical cables may be snagged causing damage to vehicle fire control system.
9. No cables should be connected or disconnected by untrained personnel.

**APPENDIX B  
TO LESSON PLAN 8  
TROUBLESHOOTING  
VIEWGRAPHS**

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